

## SEQUENCE LISTING

<110> DeAngelis, Paul

<120> HEPARIN/HEPAROSAN SYNTHASE FROM P. MULTOCIDA, SOLUBLE AND SINGLE ACTION  
CATALYSTS THEREOF AND METHODS OF MAKING AND USING SAME

<130> 4599.014

<150> 60/458,939

<151> 2003-03-31

<150> 10/142,143

<151> 2002-05-08

<150> 60/289,554

<151> 2001-05-08

<150> 60/296,386

<151> 2001-06-06

<150> 60/303,691

<151> 2001-07-06

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<170> PatentIn version 3.1

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Gln Ser Lys Ser Asn Lys Ile Glu Glu Asp Asn Ile Ser Gly Glu Asn  
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Page 10															

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Tyr Ala Asp Ser Leu Arg Lys Val Gly Met Leu Asp Thr Tyr Ile Lys  
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Ile Val Cys Tyr Leu Thr Ile Gln Ser Arg Tyr Phe Lys Asn Gly Glu  
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Arg Val Lys Leu Phe Glu His Ile Ser Asn Ala Leu Arg Tyr Ser Arg  
115 120 125

Ser Asp Phe Leu Ile Asn Leu Ile Phe Glu Arg Tyr Ile Glu Tyr Ile  
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Asn His Leu Lys Leu Ser Pro Lys Gln Lys Asp Phe Tyr Phe Cys Thr  
145 150 155 160

Lys Phe Ser Lys Phe His Asp Tyr Thr Lys Asn Gly Tyr Lys Tyr Leu  
165 170 175

Ala Phe Asp Asn Gln Ala Asp Ala Gly Tyr Gly Leu Thr Leu Leu Leu  
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Asn Ala Asn Asp Asp Met Gln Asp Ser Tyr Asn Leu Leu Pro Glu Gln  
195 200 205

Glu Leu Phe Ile Cys Asn Ala Val Ile Asp Asn Met Asn Ile Tyr Arg  
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Ser Gln Phe Asn Lys Cys Leu Arg Lys Tyr Asp Leu Ser Glu Ile Thr  
225 230 235 240

Asp Ile Tyr Pro Asn Lys Ile Ile Leu Gln Gly Ile Lys Phe Asp Lys  
245 250 255

Lys Lys Asn Val Tyr Gly Lys Asp Leu Val Ser Ile Ile Met Ser Val  
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Phe Asn Ser Glu Asp Thr Ile Ala Tyr Ser Leu His Ser Leu Leu Asn  
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Page 15





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Phe Tyr Gln Thr Pro Glu Val Asn Asp Val Val Asp Glu Arg Glu Phe  
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Ser Ala Val Gln Val Ser Thr Met Trp Asp Ser Met Val Leu Glu Leu  
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Ile Ile Phe Phe Leu Asp Phe Trp Lys Asn Ile Asp Lys Ser Ile Lys  
100 105 110

Phe Ile Met Ile Tyr Asp His Pro Lys Tyr Asn Leu Met Arg Ser Val  
115 120 125

Asn Asn Ala Pro Leu Ser Leu Asn Ile Asn Asn Ser Val Asp Asn Trp  
130 135 140

Ile Ala Tyr Asn Lys Arg Leu Leu Asp Phe Phe Leu Glu Asn Lys Glu  
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Arg Cys Val Leu Ile Asn Phe Glu Ala Phe Gln Ser Asn Lys Lys Asn  
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Ile Ile Lys Pro Leu Ser Asn Ile Ile Lys Ile Asp Asn Leu Met Ser  
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Ala His Tyr Lys Asn Ser Ile Leu Phe Asp Val Val Glu Asn Asn Asp  
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Tyr Thr Lys Ser Asn Glu Ile Ala Leu Leu Glu Lys Tyr Thr Thr Leu  
210 215 220

Phe Ser Leu Ser Ala Asn Glu Thr Glu Ile Thr Phe Asn Asp Thr Lys  
225 230 235 240

Val Ser Glu Tyr Leu Val Ser Glu Leu Ile Lys Glu Arg Thr Glu Val  
Page 17

245

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Leu Lys Leu Tyr Asn Glu Leu Gln Ala Tyr Ala Asn Leu Pro Tyr Ile  
 260 265 270

Glu Thr Ser Lys Asp Asn Val Ser Ala Glu Ala Ala Leu Trp Glu Val  
 275 280 285

Val Glu Glu Arg Asn Ser Ile Phe Asn Ile Val Ser His Leu Val Gln  
 290 295 300

Glu Ser Lys Lys Lys Asp Ala Asp Ile Glu Leu Thr Lys Ser Ile Phe  
 305 310 315 320

Lys Lys Arg Gln Phe Leu Leu Leu Asn Arg Ile Asn Glu Leu Lys Lys  
 325 330 335

Glu Lys Glu Glu Val Ile Lys Leu Ser Lys Ile Asn His Asn Asp Val  
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Val Arg Gln Glu Lys Tyr Pro Asp Asp Ile Glu Lys Lys Ile Asn Asp  
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Gln Ala Ile Ser Glu Lys Glu Gln Ile Leu Lys Gln Leu His Lys Tyr  
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Glu Glu Glu Ile Ser Glu Lys Glu Ser Lys Leu Thr Gln Ala Ile Ser  
 405 410 415

Glu Lys Glu Gln Ile Leu Lys Gln Leu His Ile Val Gln Glu Gln Leu  
 420 425 430

Glu His Tyr Phe Ile Glu Asn Gln Glu Ile Lys Lys Lys Leu Pro Pro  
 435 440 445

Val Leu Tyr Gly Ala Ala Glu Gln Ile Lys Gln Glu Leu Gly Tyr Arg  
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Leu Gly Tyr Ile Ile Val Ser Tyr Ser Lys Ser Leu Lys Gly Ile Ile  
 465 470 475 480

Thr Met Pro Phe Ala Leu Ile Arg Glu Cys Val Phe Glu Lys Lys Arg  
 485 490 495

Lys Lys Ser Tyr Gly Val Asp Val Pro Leu Tyr Leu Tyr Ala Asp Ala  
 Page 18

500

505

510

Asp Lys Ala Glu Arg Val Lys Lys His Leu Ser Tyr Gln Leu Gly Gln  
 515 520 525

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Ile Ala Ser Arg Ile Ala Asn Ser Thr Ser Lys Val Lys Thr Phe Arg  
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Lys Ser Lys Gly Asp Ile Ile Phe Phe Gln Asp Ser Asp Asp Val Cys  
 85 90 95

His His Glu Arg Ile Glu Arg Cys Val Asn Ala Leu Leu Ser Asn Lys  
 100 105 110

Asp Asn Ile Ala Val Arg Cys Ala Tyr Ser Arg Ile Asn Leu Glu Thr  
 115 120 125

Gln Asn Ile Ile Lys Val Asn Asp Asn Lys Tyr Lys Leu Gly Leu Ile  
 Page 19

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140

Thr Leu Gly Val Tyr Arg  
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&lt;211&gt; 99

&lt;212&gt; PRT

&lt;213&gt; Pasteurella multocida

&lt;400&gt; 11

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Leu His Gly Val Ile Phe Pro Ser Arg Val Asn Lys Tyr Phe Ser Ser  
35 40 45

Asp Arg Ile Val Tyr Asn Phe Gln Lys Thr Phe Arg Lys Asp Thr Ala  
50 55 60

Val Asn Ile Leu Gly Thr Gly Thr Val Ala Phe Arg Val Ser Ile Phe  
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Asn Lys Phe Ser Leu Ser Asp Phe Glu His Pro Gly Met Val Asp Ile  
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Tyr Phe Ser

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&lt;211&gt; 1722

&lt;212&gt; DNA

&lt;213&gt; Pasteurella multocida

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 Pro Leu Val Ser Ile Ile Met Thr Ser His Asn Thr Glu Lys Phe Ile  
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 Glu Ala Ser Ile Asn Ser Leu Leu Leu Gln Thr Tyr Asn Asn Leu Glu  
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 Val Ile Val Val Asp Asp Tyr Ser Thr Asp Lys Thr Phe Gln Ile Ala  
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 Ser Arg Ile Ala Asn Ser Thr Ser Lys Val Lys Thr Phe Arg Leu Asn  
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 Ser Asn Leu Gly Thr Tyr Phe Ala Lys Asn Thr Gly Ile Leu Lys Ser  
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 Lys Gly Asp Ile Ile Phe Phe Gln Asp Ser Asp Asp Val Cys His His  
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 Glu Arg Ile Glu Arg Cys Val Asn Ala Leu Leu Ser Asn Lys Asp Asn  
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 Ile Ala Val Arg Cys Ala Tyr Ser Arg Ile Asn Leu Glu Thr Gln Asn  
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 Ile Ile Lys Val Asn Asp Asn Lys Tyr Lys Leu Gly Leu Ile Thr Leu  
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 Gly Val Tyr Arg Lys Val Phe Asn Glu Ile Gly Phe Phe Asn Cys Thr  
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 Thr Lys Ala Ser Asp Asp Glu Phe Tyr His Arg Ile Ile Lys Tyr Tyr  
 210 215 220  
 Gly Lys Asn Arg Ile Asn Asn Leu Phe Leu Pro Leu Tyr Tyr Asn Thr  
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Glu Phe Gln Lys Ile His Asn Glu Arg Lys Leu Asn Glu Leu Lys Glu  
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Ile Phe Ser Phe Pro Arg Ile His Asp Ala Leu Pro Ile Ser Lys Glu  
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Ser Ile Pro Ser Arg Ile Lys Gln Leu Gln Tyr Thr Ile Gly Val Leu  
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Lys Asn Gln Cys Asp His Phe His Ile Tyr Leu Asp Gly Tyr Pro Glu  
340 345 350

Val Pro Asp Phe Ile Lys Lys Leu Gly Asn Lys Ala Thr Val Ile Asn  
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370 375 380

Leu Glu Lys Leu Ile Lys Glu Asn Lys Asp Gly Tyr Tyr Ile Thr Cys  
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Asp Asp Asp Ile Arg Tyr Pro Ala Asp Tyr Ile Asn Thr Met Ile Lys  
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Lys Ile Asn Lys Tyr Asn Asp Lys Ala Ala Ile Gly Leu His Gly Val  
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Ile Phe Pro Ser Arg Val Asn Lys Tyr Phe Ser Ser Asp Arg Ile Val  
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Tyr Asn Phe Gln Lys Pro Leu Glu Asn Asp Thr Ala Val Asn Ile Leu  
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Ser Arg Ile Ala Asn Ser Thr Ser Lys Val Lys Thr Phe Arg Leu Asn  
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Ser Asn Leu Gly Thr Tyr Phe Ala Lys Asn Thr Gly Ile Leu Lys Ser  
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Lys Gly Asp Ile Ile Phe Phe Gln Asp Ser Asp Asp Val Cys His His  
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Glu Arg Ile Glu Arg Cys Val Asn Ala Leu Leu Ser Asn Lys Asp Asn  
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Ile Ala Val Arg Cys Ala Tyr Ser Arg Ile Asn Leu Glu Thr Gln Asn  
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Ile Ile Lys Val Asn Asp Asn Lys Tyr Lys Leu Gly Leu Ile Thr Leu  
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Thr Lys Ala Ser Asp Asp Glu Phe Tyr His Arg Ile Ile Lys Tyr Tyr  
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20 25 30

Xaa Xaa Val Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Gly Xaa Tyr Xaa  
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35

40

45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Phe  
 50 55 60

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&lt;211&gt; 82

&lt;212&gt; PRT

&lt;213&gt; Artificial Sequence

&lt;220&gt;

&lt;223&gt; Motif II

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&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

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 <211> 1854  
 <212> DNA  
 <213> Pasteurella multocida

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<210> 25

<211> 617

<212> PRT

<213> Pasteurella multocida

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Gln Ser Lys Ser Asn Lys Ile Glu Glu Asp Asn Ile Ser Gly Glu Asn  
50 55 60

Lys Phe Ser Val Ser Ile Lys Asp Leu Tyr Asn Glu Ile Ser Asn Ser  
65 70 75 80

Glu Leu Gly Ile Thr Lys Glu Arg Leu Gly Ala Pro Pro Leu Val Ser  
85 90 95

Ile Ile Met Thr Ser His Asn Thr Glu Lys Phe Ile Glu Ala Ser Ile  
100 105 110

Asn Ser Leu Leu Leu Gln Thr Tyr Asn Asn Leu Glu Val Ile Val Val  
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Asp Asp Tyr Ser Thr Asp Lys Thr Phe Gln Ile Ala Ser Arg Ile Ala  
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145 150 155 160

Thr Tyr Phe Ala Lys Asn Thr Gly Ile Leu Lys Ser Lys Gly Asp Ile  
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Ile Phe Phe Gln Asn Ser Asn Asp Val Cys His His Glu Arg Ile Glu  
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Arg Cys Val Asn Ala Leu Leu Ser Asn Lys Asp Asn Ile Ala Val Arg  
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Cys Ala Tyr Ser Arg Ile Asn Leu Glu Thr Gln Asn Ile Ile Lys Val  
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Asn Asp Asn Lys Tyr Lys Leu Gly Leu Ile Thr Leu Gly Val Tyr Arg  
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Lys Val Phe Asn Glu Ile Gly Phe Phe Asn Cys Thr Thr Lys Ala Ser  
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Asp Asp Glu Phe Tyr His Arg Ile Ile Lys Tyr Tyr Gly Lys Asn Arg  
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Ile Asn Asn Leu Phe Leu Pro Leu Tyr Tyr Asn Thr Met Arg Glu Asp  
275 280 285

Ser Leu Phe Ser Asp Met Val Glu Trp Val Asp Glu Asn Asn Ile Lys  
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Gln Lys Thr Ser Asp Ala Arg Gln Asn Tyr Leu His Glu Phe Gln Lys  
305 310 315 320

Ile His Asn Glu Arg Lys Leu Asn Glu Leu Lys Glu Ile Phe Ser Phe  
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Pro Arg Ile His Asp Ala Leu Pro Ile Ser Lys Glu Met Ser Lys Leu  
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Ser Asn Pro Lys Ile Pro Val Tyr Ile Asn Ile Cys Ser Ile Pro Ser  
355 360 365

Arg Ile Lys Gln Leu Gln Tyr Thr Ile Gly Val Leu Lys Asn Gln Cys  
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Asp His Phe His Ile Tyr Leu Asp Gly Tyr Pro Glu Val Pro Asp Phe  
385 390 395 400

Ile Lys Lys Leu Gly Asn Lys Ala Thr Val Ile Asn Cys Gln Asn Lys  
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Asn Glu Ser Ile Arg Asp Asn Gly Lys Phe Ile Leu Leu Glu Lys Leu  
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Ile Lys Glu Asn Lys Asp Gly Tyr Tyr Ile Thr Cys Asp Asp Asp Ile  
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Arg Tyr Pro Ala Asp Tyr Ile Asn Thr Met Ile Lys Lys Ile Asn Lys  
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Tyr Asn Asp Lys Ala Ala Ile Gly Leu His Gly Val Ile Phe Pro Ser  
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Arg Val Asn Lys Tyr Phe Ser Ser Asp Arg Ile Val Tyr Asn Phe Gln  
485 490 495

Lys Pro Leu Glu Asn Asp Thr Ala Val Asn Ile Leu Gly Thr Gly Thr  
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Val Ala Phe Arg Val Ser Ile Phe Asn Lys Phe Ser Leu Ser Asp Phe  
515 520 525

Glu His Pro Gly Met Val Asp Ile Tyr Phe Ser Ile Leu Cys Lys Lys  
530 535 540

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545 550 555 560

Glu Asp Asn Lys Asn Thr Glu Thr Leu Phe His Glu Phe Gln Asn Arg  
565 570 575

Asp Glu Ile Gln Ser Lys Leu Ile Ile Ser Asn Asn Pro Trp Gly Tyr  
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Ile Pro Cys Leu Ser Phe Tyr Asn Glu  
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<210> 26

<211> 1854

<212> DNA

<213> Pasteurella multocida

<400> 26

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tctggagaaa acaaattttc agtatcaata aaagatctat ataacgaaat aagcaatagt      240
gaattaggga ttacaaaaga aagactagga gccccccctc tagtcagtat tataatgact      300
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aataacttag aagttatcgt ttagatgat tatagcacag ataaaacatt tcagatcgca      420
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<211> 617

<212> PRT

<213> Pasteurella multocida

<400> 27

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Glu Ser Leu Val Lys Tyr Asn Ile Asp Ile Cys Lys Lys Asn Ile Thr  
 35 40 45

Gln Ser Lys Ser Asn Lys Ile Glu Glu Asp Asn Ile Ser Gly Glu Asn  
 50 55 60

Lys Phe Ser Val Ser Ile Lys Asp Leu Tyr Asn Glu Ile Ser Asn Ser  
 65 70 75 80

Glu Leu Gly Ile Thr Lys Glu Arg Leu Gly Ala Pro Pro Leu Val Ser  
 85 90 95

Ile Ile Met Thr Ser His Asn Thr Glu Lys Phe Ile Glu Ala Ser Ile  
 100 105 110

Asn Ser Leu Leu Leu Gln Thr Tyr Asn Asn Leu Glu Val Ile Val Val  
 115 120 125

Asp Asp Tyr Ser Thr Asp Lys Thr Phe Gln Ile Ala Ser Arg Ile Ala  
 Page 40



130

135

140

Asn Ser Thr Ser Lys Val Lys Thr Phe Arg Leu Asn Ser Asn Leu Gly  
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Thr Tyr Phe Ala Lys Asn Thr Gly Ile Leu Lys Ser Lys Gly Asp Ile  
165 170 175

Ile Phe Phe Gln Asp Ser Asp Asp Val Cys His His Glu Arg Ile Glu  
180 185 190

Arg Cys Val Asn Ala Leu Leu Ser Asn Lys Asp Asn Ile Ala Val Arg  
195 200 205

Cys Ala Tyr Ser Arg Ile Asn Leu Glu Thr Gln Asn Ile Ile Lys Val  
210 215 220

Asn Asp Asn Lys Tyr Lys Leu Gly Leu Ile Thr Leu Gly Val Tyr Arg  
225 230 235 240

Lys Val Phe Asn Glu Ile Gly Phe Phe Asn Cys Thr Thr Lys Ala Ser  
245 250 255

Asp Asp Glu Phe Tyr His Arg Ile Ile Lys Tyr Tyr Gly Lys Asn Arg  
260 265 270

Ile Asn Asn Leu Phe Leu Pro Leu Tyr Tyr Asn Thr Met Arg Glu Asp  
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Ser Leu Phe Ser Asp Met Val Glu Trp Val Asp Glu Asn Asn Ile Lys  
290 295 300

Gln Lys Thr Ser Asp Ala Arg Gln Asn Tyr Leu His Glu Phe Gln Lys  
305 310 315 320

Ile His Asn Glu Arg Lys Leu Asn Glu Leu Lys Glu Ile Phe Ser Phe  
325 330 335

Pro Arg Ile His Asp Ala Leu Pro Ile Ser Lys Glu Met Ser Lys Leu  
340 345 350

Ser Asn Pro Lys Ile Pro Val Tyr Ile Asn Ile Cys Ser Ile Pro Ser  
355 360 365

Arg Ile Lys Gln Leu Gln Tyr Thr Ile Gly Val Leu Lys Asn Gln Cys  
370 375 380

Asp His Phe His Ile Tyr Leu Asp Gly Tyr Pro Glu Val Pro Asp Phe  
Page 41

385                      390                      395                      400

Ile Lys Lys Leu Gly Asn Lys Ala Thr Val Ile Asn Cys Gln Asn Lys  
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Asn Glu Ser Ile Arg Asp Asn Gly Lys Phe Ile Leu Leu Glu Lys Leu  
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Ile Lys Glu Asn Lys Asp Gly Tyr Tyr Ile Thr Cys Asn Asp Asn Ile  
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Tyr Asn Asp Lys Ala Ala Ile Gly Leu His Gly Val Ile Phe Pro Ser  
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Arg Val Asn Lys Tyr Phe Ser Ser Asp Arg Ile Val Tyr Asn Phe Gln  
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<211> 651

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<213> Pasteurella multocida

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			20					25					30		

Asp	Ser	Leu	Lys	Thr	Thr	Leu	Asn	Lys	Asp	Ile	Ile	Ser	Gln	Gln	Thr
		35					40					45			

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Asn Glu Asn Lys Leu Leu Leu Lys Gln Leu Gln Leu Val Leu Gln Glu  
65 70 75 80

Phe Glu Lys Ile Tyr Thr Tyr Asn Gln Ala Leu Glu Ala Lys Leu Glu  
85 90 95

Lys Asp Lys Gln Thr Thr Ser Ile Thr Asp Leu Tyr Asn Glu Val Ala  
100 105 110

Lys Ser Asp Leu Gly Leu Val Lys Glu Thr Asn Ser Ala Asn Pro Leu  
115 120 125

Val Ser Ile Ile Met Thr Ser His Asn Thr Ala Gln Phe Ile Glu Ala  
130 135 140

Ser Ile Asn Ser Leu Leu Leu Gln Thr Tyr Lys Asn Ile Glu Ile Ile  
145 150 155 160

Ile Val Asp Asp Asp Ser Ser Asp Asn Thr Phe Glu Ile Ala Ser Arg  
165 170 175

Ile Ala Asn Thr Thr Ser Lys Val Arg Val Phe Arg Leu Asn Ser Asn  
180 185 190

Leu Gly Thr Tyr Phe Ala Lys Asn Thr Gly Ile Leu Lys Ser Lys Gly  
195 200 205

Asp Ile Ile Phe Phe Gln Asp Ser Asp Asp Val Cys His His Glu Arg  
210 215 220

Ile Glu Arg Cys Val Asn Ile Leu Leu Ala Asn Lys Glu Thr Ile Ala  
225 230 235 240

Val Arg Cys Ala Tyr Ser Arg Leu Ala Pro Glu Thr Gln His Ile Ile  
245 250 255

Lys Val Asn Asn Met Asp Tyr Arg Leu Gly Phe Ile Thr Leu Gly Met  
260 265 270

His Arg Lys Val Phe Gln Glu Ile Gly Phe Phe Asn Cys Thr Thr Lys  
275 280 285

Gly Ser Asp Asp Glu Phe Phe His Arg Ile Ala Lys Tyr Tyr Gly Lys  
290 295 300

Glu Lys Ile Lys Asn Leu Leu Pro Leu Tyr Tyr Asn Thr Met Arg  
305 310 315 320

Glu Asn Ser Leu Phe Thr Asp Met Val Glu Trp Ile Asp Asn His Asn  
325 330 335

Ile Ile Gln Lys Met Ser Asp Thr Arg Gln His Tyr Ala Thr Leu Phe  
340 345 350

Gln Ala Met His Asn Glu Thr Ala Ser His Asp Phe Lys Asn Leu Phe  
355 360 365

Gln Phe Pro Arg Ile Tyr Asp Ala Leu Pro Val Pro Gln Glu Met Ser  
370 375 380

Lys Leu Ser Asn Pro Lys Ile Pro Val Tyr Ile Asn Ile Cys Ser Ile  
385 390 395 400

Pro Ser Arg Ile Ala Gln Leu Arg Arg Ile Ile Gly Ile Leu Lys Asn  
405 410 415

Gln Cys Asp His Phe His Ile Tyr Leu Asp Gly Tyr Val Glu Ile Pro  
420 425 430

Asp Phe Ile Lys Asn Leu Gly Asn Lys Ala Thr Val Val His Cys Lys  
435 440 445

Asp Lys Asp Asn Ser Ile Arg Asp Asn Gly Lys Phe Ile Leu Leu Glu  
450 455 460

Glu Leu Ile Glu Lys Asn Gln Asp Gly Tyr Tyr Ile Thr Cys Asp Asp  
465 470 475 480

Asp Ile Ile Tyr Pro Ser Asp Tyr Ile Asn Thr Met Ile Lys Lys Leu  
485 490 495

Asn Glu Tyr Asp Asp Lys Ala Val Ile Gly Leu His Gly Ile Leu Phe  
500 505 510

Pro Ser Arg Met Thr Lys Tyr Phe Ser Ala Asp Arg Leu Val Tyr Ser  
515 520 525

Phe Tyr Lys Pro Leu Glu Lys Asp Lys Ala Val Asn Val Leu Gly Thr  
530 535 540

Gly Thr Val Ser Phe Arg Val Ser Leu Phe Asn Gln Phe Ser Leu Ser  
545 550 555 560

Asp Phe Thr His Ser Gly Met Ala Asp Ile Tyr Phe Ser Leu Leu Cys  
565 570 575

Lys Lys Asn Asn Ile Leu Gln Ile Cys Ile Ser Arg Pro Ala Asn Trp  
580 585 590

Leu Thr Glu Asp Asn Arg Asp Ser Glu Thr Leu Tyr His Gln Tyr Arg  
595 600 605

Asp Asn Asp Glu Gln Gln Thr Gln Leu Ile Met Glu Asn Gly Pro Trp  
610 615 620

Gly Tyr Ser Ser Ile Tyr Pro Leu Val Lys Asn His Pro Lys Phe Thr  
625 630 635 640

Asp Leu Ile Pro Cys Leu Pro Phe Tyr Phe Leu  
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